SYNOPSIS FOR THESIS

"Study of Some Transformation on Boehmians Spaces and their Applications"

Submitted to

Swami Ramanand Teerth Marathwada University,
Nanded- 431606.

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड.

For the Degree of

Doctor of Philosophy (Ph.D.)

In Mathematics

(Faculty of Science and Technology)

Submitted by

Mr. Vihar Shivaji Shinde

Under the Guidance of

Dr. S. B. Chavhan

(Research Supervisor)

Head, Dept. of Mathematics

Digambarrao Bindu ACS College, Bhokar,

Dist. Nanded, (Maharashtra).

December 2020

"Study of Some Transformation on Boehmians Spaces and their Applications"

1) Introduction:-

The theory of Integral Transform is a classical subject in mathematics whose literature can be traced back through at least 175 years. The classical theory of integral transforms of functions and their applications are too well known. Integral transforms of generalized functions are used in various problems of mathematical Physics and applied Mathematics. The impact of generalized function on the integral transform has recently revolutionaries the theory of generalized integral transformations. L. Schwartz [13] gives the theory of distributions in 1944-51.

2) Review of Literature:-

We reviewed the literature about the basics Bargmann transform introduced by Thomas and Wassell. The Shearlet transform in arbitrary space dimensions is given by S. Dahlke, G. Steidl and G. Teschke [3]. Linear Canonical Transforms is given by J.J., Kutay**,** M.A., Ozaktas**,** and H.M. Sheridan. Lambert transform is introduced by D.V. Widder [5]. Quaternion Fourier Tansform by Bahri, M., Ashino, R., Vaillancourt [4].

A. H. Zemanian [12] gives generalization of number of commonly encountered integral transform. His idea is use to construct testing functions spaces which contains appropriate kernels of integral transform and to extend the classical theories of such integral transforms to the duals of the corresponding testing function spaces. The theory thus developed is then applied to find generalized solution of partial differential equations and integral equations. In fact, the space of distribution can be viewed as proper subspaces of certain Boehmians spaces. The concept of Boehmians was motivated by the Mikusinski' Operators particularly by the regular operators introduced by T. K. Boehme [16].

3) Methodology:-

This study was done by experimental theoretical basis. The methodology used for this study was close reading and explication. Several books and articles in journals were collected for Bargmann transform, Shearlet transform, Linear Canonical Transforms, Lambert transform, Quaternion fourier transform and Boehmians Spaces. Web sources were used for recent development in the research field. Use of computer and high-end software like Matlab will also be done to obtain and /or verify as many results as possible.

4) Objectives:-

i) To construct Boehmians spaces and applying Bargmann transform on new constructed Boehmians spaces

ii) To construct Boehmians spaces and applying shearlet transform on new constructed Boehmians spaces

iii) To construct Boehmians spaces and applying Linear Canonical Transforms on new constructed Boehmians spaces

iv) To construct Boehmians spaces and applying Lambert transform on new constructed Boehmians spaces

v) To construct Boehmians spaces and applying Quaternion fourier transform on new constructed Boehmians spaces

Boehmians spaces using two different techniques, one analytic and the other algebraic. The algebraic approach requires the introduction of a new convolution operation for the transform that makes the transform of a convolution of two functions almost equal to the product of their transforms.

5) Year wise plan of work and target to be achieved:-

First year:-

Collect the statistical data on Bargmann transform, Shearlet transform, Linear Canonical Transforms, Lambert transform, Quaternion fourier transform and Boehmians Spaces by referring books, journals regarding subject. Analysis of results and data regarding this problem.

Second year:-

Construct Boehmians spaces for Bargmann transform, Shearlet transform and Linear Canonical Transforms and applying transformation new construct Boehmians spaces.

Third year:-

Construct Boehmians spaces for Lambert transform and Quaternion Fourier transform and applying transformation new construct Boehmians spaces.

Fourth Year Plan:

Finally Thesis will be submitted.

6) Significant outcome from Proposed Work:-

The application of Bargmann transform, Shearlet transform, Linear Canonical Transforms, Lambert transform, Quaternion fourier transform is used in various fields such as mathematics, Physics, and biology, for example differential equation, Signal Processing.

7) References:-

[1] V. Bargmann, "On a Hilbert space of analytic functions and an associated integral transform. I," Commun. Pure Appl. Math. 14, 187–214 (1961).

[2] B. Hall, "Holomorphic methods in analysis and mathematical physics," in First Summer School in Analysis and Mathematical Physics Quantization, the Segal-Bargmann Transform and Semiclassical Analysis, Contemporary Mathematics Vol. 260, edited by S. Pérez-Esteva and C. Villegas-Blas (American Mathematical Society, Providence, RI, 2000). Bargmann transform introduced by Thomas and Wassell [J. Math. Phys. 36, 5480–5505 (1995)].

[3] The continuous Shearlet transform in arbitrary space dimensions is given by S. Dahlke, G. Steidl and G. Teschke J. Fourier Anal. Appl. 16 (2010), 340–364.

[4] Bahri, M., Ashino, R., Vaillancourt, R.: Convolution theorem for quaternion fourier transform: properties and applications. Abstr. Appl. Anal. 2013, 10 (2013)

[5] D.V. Widder, "An inversion of the Lambert transform" Math. Mag. , 23 (1950) pp. 171–182

[6] Schwartz, L., The´orie des distributions, Hermann, Paris (1966).

[7] Zemanian,A.H., Distribution Theory and Transform Analysis, Dover Publications, Inc.,NewYork(1987).

[8] Ahmad I. Zayed, "Fractional Fourier transform of Generalizes Functions" University of central Florida Orlando, FL 32816

[9] Tohru Morita and Ken-ichi Sato, "Solution of Fractional Differential equation in terms of Distribution Theory" Interdisciplinary Information Science, Vol. 12, No.2, pp.71-83 (2006)

[10] Namias V.: The traditional order Fourier transform and its application to Quantum Mechanics J, Institute of Math,

[11] Widder D.V., The Laplace transform; Princeton Univ. Press, Princeton N.J., 1966.

[12] Zemanian A.H., "Distribution theory and transform analysis," McGraw Hill, New York, 1965.

[13] Zemanian A.H., Generalized integral transform," Inter Science Publisher's New York, 1968.

[14] V. Swaminathan and K. Krishna, The Laplace transform of tempered Boehmians. , Acta cienc Indica math. , 28 (2002).

[15] P. Mikusinski, Fourier transform for integrable Boehmians Rocky Mountain J.Math. 17 (1987).

[16] Boehme T.K., The support of Mikusinski Operators, Trans. Amer. Math. Soc. 176 (1973), 319-334.

Mr. Vihar Shivaji Shinde
(Research Scholar)

Dr. S. B. Chavhan
Head, Dept. of Mathematics
Digambarrao Bindu ACS College, Bhokar,
Dist. Nanded, (Maharashtra).